THE DENTAL PRACTITIONER
AND DENTAL RECORD

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CONTENTS

		PAGE
Editorial: Literary Dentists		333
Rubber-base Impression Materials	*G. S. Beagrie, F.D.S. R.C.S. (Edin.)*	334
Stainless Steel Tubing as an Aid in the Treatment of Crownless Upper Anterior Teeth	*D. M. McGibbon, L.D.S. (Edin.)*	338
Determination of Oral Muscle Forces	*Robert E. Probst and Hans R. Mühlemann*	342
Variations on a Scheme by Andresen	*D. F. Glass, L.D.S., D.D.O.*	346
Congenital Keratosis of the Gingiva	*J. R. Trott, B.D.S.*	348
The New Look in Orthodontics	*J. H. Hovell*	350
New Lighting System in Dental Surgery		358
Abstracts from Other Journals		337, 345, 349, 357, 360
National Health Service Notes		359
General Dental Council		359
Book Review		360

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THE DENTAL PRACTITIONER

AND DENTAL RECORD

Vol. VI, No. 11 July, 1956

EDITORIAL

LITERARY DENTISTS

THE dental surgeon as an author is not altogether unknown but it cannot be said that the profession is noted for its literary talent. We have yet to produce a Somerset Maugham or an A. J. Cronin, or as far as it is known a literary giant who took up the pen after failing his anatomy and physiology The wider world of medicine, with its symbolism of life and death, will obviously appeal more to the general public than the plots and crises of the dental surgery. But there is tragedy and comedy in both, a fact proven by the writings of Edward Samson over a number of years.

An author need not be erudite to write a book, but he certainly needs a vocabulary and an imagination, qualities that a member of any profession should possess. On the whole the dental profession is possibly more materialistic in outlook than the medical profession, a fact brought out by a recent inquiry in the U.S.A. in asking students why they took up medicine or dentistry (J.A.C.D. 23. 1). It would be wrong to assume from this that we work purely for material gain, but there are few people who would say that they practise dentistry from a high altruistic plane. Literature by itself does not offer a life of comfort and luxury except to the chosen few, so those who pursue these paths in addition to their professional life must make their writing a labour of love. Apart from a few exceptions the dentist has made few excursions into the realms of literature and the public have thereby lost a chance to see inside a dental surgery from his own philosophic viewpoint. A new book* by Haddon Rowat helps in its own small way to rectify this. This book "on the musings and memories of a dental surgeon" (to be reviewed next month) is by a member of the profession who has seen more of dentistry than the majority of practitioners and undoubtedly visited more places. As he says so delightfully in his preface, the lay reader will wish to know what goes on "in between times when he is not holding hands with his beautiful receptionist or shovelling money into the safe"—which is all too often the conception of the dentist by his patients. It is to be hoped that the appearance of this book may stimulate others in our profession to put on for a while the mantle of authorship and to give us more of these delightful sidelights on the workaday picture of dentistry.

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* *This Won't Hurt a Bit* (Bristol: John Wright & Sons Ltd.).

RUBBER-BASE IMPRESSION MATERIALS

THEIR STUDY AND A TECHNIQUE FOR USE IN CONSERVATIVE DENTISTRY

By **G. S. BEAGRIE**, F.D.S. R.C.S. (Edin.)
Department of Conservative Dentistry, Edinburgh School of Dental Surgery

In the construction of an accurate gold inlay a number of procedures is involved, each of which must be carefully executed if a successful result is to be obtained. Not the least important of these is an exact impression of the cavity itself and the adjacent teeth. The inlay restoring the anatomy of the subject tooth must fit the cavity with a high degree of accuracy and, in addition, must give a correct restoration of the contact points with the neighbouring teeth and occlusal harmony with the opposing teeth.

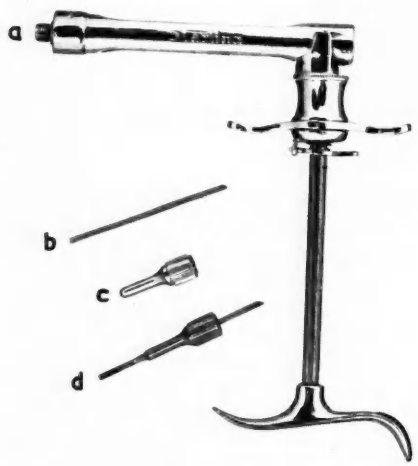

Fig. 1.—a, Nozzle of syringe bored with No. 5 round bur; b, Orthodontic S.S. tube 0·9 mm. inner diameter sharpened at one end into a 'needle' point; c, Hub of syringe bored with No. 5 round bur to accommodate the S.S. tube; d, Completed injection attachment with S.S. tube soldered to the hub.

Using the direct method, the production of an inlay fulfilling these requirements is difficult and time-consuming both for the operator and the patient, particularly when dealing with posterior teeth. In consequence, an indirect method is preferable.

For any indirect inlay technique a material is required which will give an accurate reproduction of the cavity form and adjacent teeth, and maintain its shape on removal from the mouth. Materials which seem to fulfil these requirements are the rubber-base impression materials. The following have been tested during the past two years in the Conservation Department of the Edinburgh School of Dental Surgery with satisfactory results: "Permlastic" (Kerr Manufacturing Co., Detroit 8, Mich.); "Coeflex" (Coe Laboratories Inc., Chicago 21, Ill.); "Scania" (Dentalmaterial Aktiebolag, Hagersten, Sweden).

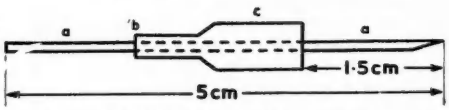

Fig. 2.—a, Orthodontic S.S. tube; b, Soldered joint; c, Hub of cartridge syringe.

The essential ingredient of these materials is a liquid polysulphide rubber. This polysulphide possesses extremely reactive sulphur hydrogen terminals in its chain construction and a polymerization or cold vulcanization can be brought about by certain activators to produce an elastic, strong, and dimensionally stable synthetic rubber (Skinner and Cooper, 1955). This reaction is accelerated by heat.

The materials are dispensed in two tubes. One contains the liquid rubber which is made into a white paste by an inert filler such as zinc oxide, to facilitate control of the material (Pearson, 1955). The other is a brown oily substance composed mainly of lead peroxide, which is the activator. The manufacturers have so balanced their materials that when they are mixed in their stated proportions, vulcanization takes place in three to five minutes at mouth temperature of 37° C.

Apart from having an accurate impression material which is stable against dimensional change, it is necessary to construct a model in a substance which will give a replica of the inlay cavity and associated dental tissues. Ideally, models and dies for inlay construction are best made by electroplating the impression surface. Rubber-base impressions can be electroplated by painting on them a thin layer of colloidal graphite, but results obtained by these methods have not been sufficiently encouraging to allow their recommendation.

The use of an artificial stone to make a model, in conjunction with an injection technique for the rubber-base materials, has produced results which give a clinical indication of superiority over all other impression materials used in conservative dentistry, including the reversible hydrocolloids. The stone is mixed and vibrated carefully into the impression. The model, when formed, is trimmed free from undercuts, rebased and sectioned carefully with a fine fretsaw blade at and past the cervical margin of the inlay cavities. Each saw cut is carried to a depth of two-thirds of the model, the remaining one-third being fractured for separation. This allows access to the cervical margins during the carving of the inlay wax, accurate repositioning of the sections being provided by means of the new base (Hampson, 1950).

The injection technique, explained below, conveys the rubber accurately and easily to the essential parts of the cavity and avoids air trapping. In addition, the gingival tissue at the cervical margin is in most cases deflected. This avoids gum retraction prior to impression taking, which is necessary if hydrocolloid materials are used.

The equipment required for this technique can be made without difficulty. It consists of:—

1. A dry, clean, anæsthetic cartridge tube with the rubber cap and plunger removed.

2. A $2\frac{1}{2}$-c.c. anæsthetic cartridge syringe, to which is connected a modified hub and needle-like attachment. The latter is an orthodontic stainless steel tube of 0·9-mm. inner diameter, sharpened at one end to a needle point, the hub and nozzle of the syringe being bored with a round bur No. 5 to accommodate it. The hub is soldered to the orthodontic tube (*Figs.* 1, 2) after ensuring that the needle point extends sufficiently far into the barrel of the syringe to penetrate the rubber cap of the anæsthetic tube.

The anæsthetic cartridge syringe so adapted can still be used for administration of local anæsthetic.

THE IMPRESSION TAKING

Stage 1.—This consists in taking a composition impression of the selected inlay area in a partial impression tray. When removed from the mouth the impression is chilled and then re-inserted to determine the line of insertion and the accuracy of fit. If undercuts at the periphery of the impression prevent easy insertion, these should be removed.

Fig. 3.—The prepared tray with periphera retention holes drilled and inlay areas cleared of composition.

The composition is cleared from the inlay areas with a large vulcanite bur under cold running water. Retention holes are drilled over the whole impression surface with a round bur (No. 8) to prevent any movement of the rubber-base material at the final stage of the impression taking (*Fig.* 3).

Any physical change which may take place in the lining composition does not appear to affect the accuracy of the impression, as the clinical results obtained have been satisfactory.

As an alternative to the above, a "special tray" can be made according to individual choice, but this would normally entail another visit of the patient.

Stage 2.—A suitable quantity of the rubber-base material is mixed according to the manufacturer's instructions. The mixing time is approximately 1 minute. A quantity of the

mix is inserted into the glass cartridge tube by packing the material into the open tube with a spatula, or by attaching the tube to the rubber bulb of a chip syringe and drawing up the material. Excess rubber is wiped off with gauze and the plunger and cap are placed

Fig. 4.—Illustrates the injecting of an M.O.D. cavity in an upper left first premolar.

Fig. 6.—The impression removed.

in situ. The tube is introduced into the syringe (with modified nozzle and needle attached), ensuring that the rubber cap is pierced by the needle. Pressure is gradually applied to the plunger, causing the rubber to flow easily from the syringe. The remainder of the mix is filled into the inlay areas of the prepared tray. The cavities are wiped free of excess saliva (but not dried), then injected, firstly at the cervical margins, secondly at the line angles, and finally completely filled with the rubber base (*Fig.* 4). The loaded tray is placed in position (*Fig.* 5) and held for 3–5 minutes until the chemical setting process of the material is complete. The surface of the injected material must not be contaminated with saliva while the tray is being inserted. The impression is removed with a single movement and examined (*Fig.* 6). It is then cast in the artificial stone.

Fig. 5.—The "loaded tray" about to be placed in position.

The time required to fill the anæsthetic tube with the material, load the prepared tray, inject the inlay cavity, and place the tray in position is 1 minute.

Cleaning the Syringe.—To clean the syringe and nozzle after use, allow the material to set, stretch the excess protruding from the nozzle to break its attachment at the sides, after which it can easily be withdrawn.

CASE REPORTS

To show the scope of these materials for general practice the following cases are submitted as examples:—

Case 1.—An upper left first premolar required restoration with an M.O.D. inlay. The cavity was prepared and the impression taken with the rubber-base material in the manner described. An impression was taken of the opposing lower jaw for articulation. At the next visit the inlay was inserted (*Fig.* 7).

Case 2.—This case was presented with secondary caries related to a large broken M.O.D. amalgam in an upper left first molar. In addition, M.O.D. cavities were found on the first and second premolars. It was decided that inlays would be required to restore the lost tissue satisfactorily. Two visits were required for the completion of the case (*Fig.* 8).

Case 3.—This case demonstrates how this technique can be used in multiple inlay construction. The cavities on the left quadrant were prepared under inferior dental regional block analgesia and the impressions taken during

the same visit. At the next visit the inlays were inserted with minor adjustments to the contact points. The restorations are large M.O.D. inlays on the first, second, and third molars. The inlays on the right quadrant—a Class II inlay on the second premolar and two three-quarter type inlays on the first and second molars—were prepared similarly in two visits (*Fig.* 9).

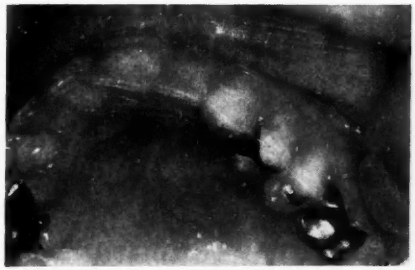

Fig. 7.—Illustrates the technique applied to the single tooth cavity. The inlays in both $\underline{|4}$ and $\underline{|6}$ were constructed by the described method.

Fig. 9.—Multiple inlay construction related to $\overline{765}|\underline{678}$

SUMMARY

A method of applying an injection technique for rubber-base impression materials has been described and 3 cases have been shown. The advantages are:—

1. The material is conveyed easily to the tooth cavities and air trapping at the essential parts is avoided.

2. An accurate reproduction of the cervical margin of the cavity is given, usually without gum retraction.

3. As the material is expensive, it is economical to line a tray with composition to decrease the amount of rubber base used. In addition, a thin layer of the material gives greater accuracy (Skinner and Cooper, 1955).

4. Accurate orientation of the affected teeth is given for the restoration of contact points and occlusion.

5. It is simple to use, whether for single or multiple restorations.

Fig. 8.—Shows the method applied to quadrant inlay work.

Acknowledgements. — I am grateful to Professor A. C. W. Hutchinson for his help and encouragement in the preparation of this article, and to Lt.-Col. W. P. Baxendine, Director of Conservative Dentistry, in whose department the work was carried out.

For the photographs I wish to thank Mr. C. E. Chapman and the staff of the Oral Pathology Department of the Edinburgh School of Dental Surgery.

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HAMPSON, E. L. (1950), *Brit. dent. J.*, **88**, 240.
PEARSON, S. L. (1955), *Ibid.*, **99**, 72.
SKINNER, E. W., and COOPER, E.N. (1955), *J. Amer. dent. Ass.*, **51**, 523.

Laminated Arches—The Double Ribbon and Double Edgewise

Split or double edgewise arches measuring 0·011 by 0·028 in. and held together by rectangular tubes to which are soldered the retraction hooks, have good lateral strength for arch form and resiliency for rotation, anterior tipping, and second order bends in the posterior region. The laminated ribbon arc is made from 0·011 by 0·022 in. wire. The ribbon arch may be used laminated only from cuspids to molars with a coil spring added as a retracting force.—CAREY, C. W. (1956), *Amer. J. Orthodont.*, **42**, 47.

STAINLESS STEEL TUBING AS AN AID IN THE TREATMENT OF CROWNLESS UPPER ANTERIOR TEETH

By **D. M. McGIBBON**, L.D.S. (Edin.)
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THE upper anterior tooth which has lost its natural crown and is level with the gum presents a problem when restoration by root treatment and crowning is contemplated (*Fig.* 1). It is not always possible to fit rubber-dam to such a tooth, and even when this can

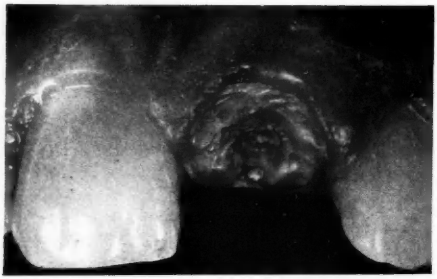

Fig. 1.—The problem.

be achieved, doubts may remain whether a sterile field is available. In addition, although the patient is anxious to have the tooth restored immediately, this must be delayed until completion of root treatment, a period of possibly several weeks.

Girdwood (1901) described the use of tube posts instead of solid posts for crowns. This allowed the immediate restoration of a root with a crown, and at the same time provided access through the crown and tube post to the root canal for root treatment.

The technique to be described in the treatment of these teeth is based on the method advocated by Girdwood (1901, 1914, 1918), which has fallen into disuse. Briefly, it consists of enlarging the root canal for a short distance and cementing a stainless steel tube into the enlarged part of the canal. An acrylic tooth, through which a hole has been drilled to accommodate the tube, is cemented over the part of the tube which protrudes from the root face. Rubber-dam can be readily fitted over this crown and access made to the root canal through the tube. A sterile approach is now available to the root canal, and the crown of the tooth is temporarily restored.

EQUIPMENT

1. *A set of root reamers and twist drills for use in a straight handpiece* (*Fig.* 2): The set is made up from Peeso root reamers No. 1, 2, and 3, and three twist drills. In that order they graduate progressively in size from the No. 1 Peeso reamer (diam. 1·3 mm.) to the

Fig. 2.—Set of root reamers and twist drills. *Left*, The shortened Peeso reamers; *Right*, Twist drills.

largest twist drill (diam. 2·34 mm.). The Peeso reamers as supplied by the manufacturers are longer than the twist drills and need to be shortened at the shank, to equal the latter in length from the shoulder of the cutting edge to the end of the shank.

2. *A straight handpiece with a distance piece attached* (*Fig.* 3): This permits the reaming and drilling of the root canal to a determined depth. The handpiece used by the writer required a slight modification before a distance

piece could be fitted. The sleeve of the handpiece was turned on a lathe in order to true up the section between the serrated finger-grip and the taper of the operating end.

The distance piece is made from two parts: (*a*) A metal collar, which slides over the cylindrical section turned on the handpiece, and (*b*) a length of 1-mm. stainless-steel wire soldered to the collar. The wire has a loop

Fig. 3.—Diagram showing straight handpiece with distance piece.

at the free end, which is bent at right angles to encircle the reamers and drills when held in the handpiece. The distance piece is set to allow a cutting depth of 6 mm., using the shortened reamers or the twist drills.

3. *Sections of stainless steel tubing threaded on the outside* (*Fig.* 4): These are prepared from tubing of 2·2-mm. external diameter and of an internal diameter which will provide a sliding fit for 1·5-mm. wire (*Fig.* 5 A). A screw thread is made on the outside of the tubing with a 6 B.A. screw-cutting die (*Fig.* 5 B). This increases its external diameter to 2·3 mm. The tubing thus prepared is cut into sections of 1 cm. (*Fig.* 5 C). At one end a taper is made which corresponds to that on the cutting edge of the twist drills; at the other end a bevel is made which extends for 2 mm. (*Fig.* 5 D).

4. *A stainless steel wire stylet* (*Fig.* 5 E): This is prepared from a $2\frac{1}{2}$-in. length of 1·5-mm. wire; it is bent at right angles 1 in. from one end. This end is provided with a taper which corresponds to that on the cutting end of the reamers.

5. *A selection of upper anterior acrylic teeth*: These should vary in shade, form, and size. The ideal tooth is large, with a bulbous labial face, a well-marked cingulum, and a broad base.

TECHNIQUE

It is accepted, before treatment is commenced, that a thorough clinical and radiographic examination has been made of the root and surrounding tissues, to ensure the presence of suitable conditions for root treatment and crowning.

The technique can be divided into four stages: (1) Preparation of the root; (2) Adjustments on fitting the tube section; (3) Preparation of the temporary crown; (4) Assembly of the tube section and crown to the root.

Fig. 4.—Enlarged sectional diagram of tube section.

1. Preparation of the Root.—The first step is to remove any carious dentine and decalcified enamel from the root face, which is shaped to accommodate a temporary crown. The root canal is reamed and irrigated to remove any debris or root filling (*Fig.* 6 A).

With the distance piece attached to the straight handpiece, and using a suitable reamer, the root canal is enlarged to a depth of 6 mm. The extension beyond

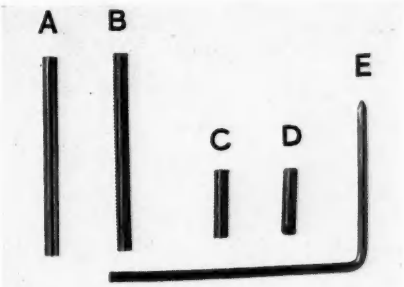

Fig. 5.—From left to right, A, Stainless steel tubing; B, Threaded tubing; C, Tube section; D, Tube section complete with taper and bevel; E, Wire stylet.

the cutting end of this reamer acts as a guide in maintaining alinement with the canal (*Fig.* 6 B).

Progressively larger reamers and drills are used up to the largest drill (*Fig.* 6 C). When this is removed the form of the enlarged canal is seen (*Fig.* 6 D).

2. Adjustments on fitting the Tube Section.—A prepared tube section is pressed firmly to the end of the enlarged canal. The tapered end fits closely against this surface (*Fig.* 6 E). The ledge of dentine formed here, if left, would

catch the points of hand reamers during subsequent root treatment. It is removed by reaming through the tube with the No. 1 Peeso reamer with the distance piece removed from the handpiece (*Fig.* 6 F). An unobstructed approach is thus gained to the root canal.

An extension of the tube through the prepared crown is then visualized; with this as a guide, and using a large round bur, two holes are drilled in the crown, one from the base, the other from the lingual surface. These holes are joined and enlarged to accommodate the tube.

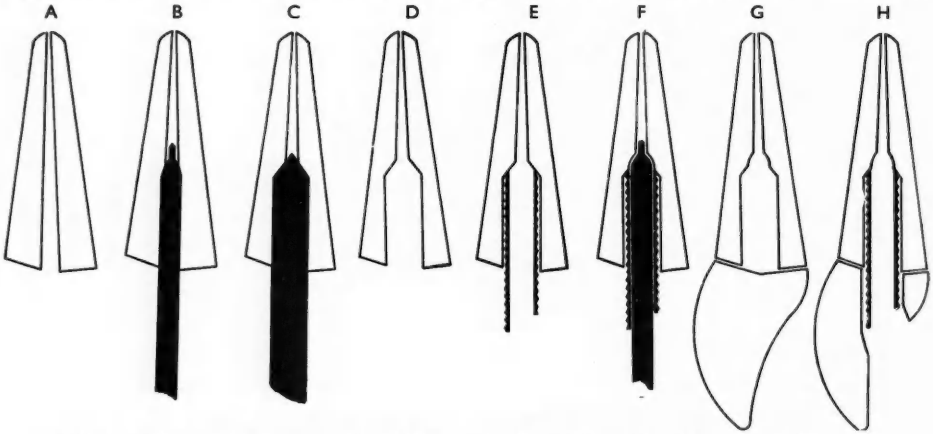

Fig. 6.—Diagrams showing preparation of the root canal and fitting of the tube section and crown.

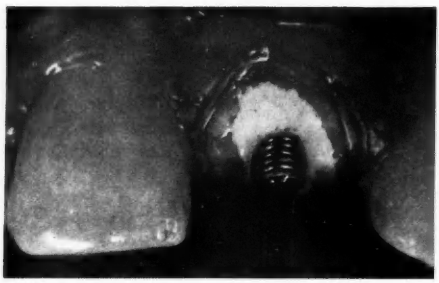

Fig. 7.—Cementing the tube section with the wire stylet in position.

Fig. 8.—The temporary crown.

With the bevel of the tube facing lingually the teeth are occluded. If necessary the tube is slightly reduced at the bevelled end to provide clearance from the opposing teeth.

3. Preparation of the Temporary Crown.—The tube is removed from the canal. A suitable acrylic tooth is selected for the construction of a temporary crown. The base of this tooth is stoned to fit the root face, the mesial and distal surfaces being trimmed to provide contact points with the adjacent teeth (*Fig.* 6 G).

The tube is refitted to the canal. The crown is fitted over the tube on to the root face, trimmed to the occlusion of the opposing teeth, and finally shaped and polished (*Fig.* 6 H). It will be seen that in order to provide space for the tube, the crown has been shaped with a bulbous labial face.

4. Assembly of the Tube Section and Crown to the Root.—The canal, root face, tube section, and crown are dried. The tapered end of the stylet, which has been lightly coated with petroleum jelly, is passed through the

tube. The latter and the wall of the enlarged part of the canal are coated with a thin mix of cement. The tube is then fitted into the entrance of the canal and the stylet is passed to the opening of the root canal, where it is held firmly whilst the tube is pressed into place, its bevelled surface facing lingually (*Fig.* 7). Occlusion of the root canal with cement is prevented by the presence of the stylet. When the cement has set the stylet is removed. The tube is now locked securely in the canal. Any excess cement which has extruded on to the root face is removed.

A quick-setting mixture of zinc oxide and eugenol is used to cement the crown into place. The tapered end of the stylet is passed through the crown and into the tube. The cement is then applied to the root face, the tube, and the base of the crown, which is seated firmly into position over the tube. When the cement has set, the stylet is removed, leaving a clear approach to the root canal.

The patient now has a restoration which, though of a temporary nature, is adequate for the period of root treatment (*Fig.* 8). Rubber-dam can be fitted with the knowledge that a sterile field is available for root treatment (*Fig.* 9).

SUBSEQUENT TREATMENT

The method adopted for root treatment is a matter of personal choice. The tube will accommodate hand reamers of adequate size provided they have a narrow shank. The writer uses Swiss-made hand reamers.

The root canal only is filled with gutta-percha.

When root treatment is completed, the temporary crown is carefully removed and set aside. Using a diamond disk the tube is cut through level with the root face; the root is then prepared for a permanent crown. Until this is fitted the temporary crown is again utilized with a post of 1·5-mm. wire. The post-wire is cemented in the tube and crown with a quick-setting mixture of zinc oxide and eugenol.

This technique has been used for a period of over two years by several operators. The results have been satisfactory. From a purely mechanical point of view there are two contra-indications: First, an abnormally narrow root, which would be weakened by drilling; secondly,

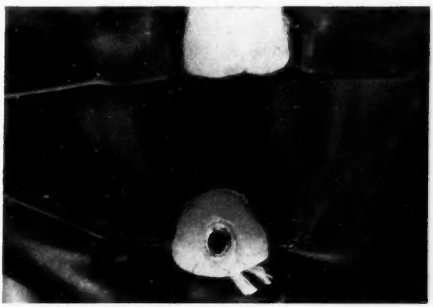

Fig. 9.—Mirror view of the temporary crown after rubber-dam has been fitted. Shows the access present to the root canal.

extensive central caries of the root, removal of which would leave insufficient retention for the tube section.

Finally, care must be exercised when drilling the root canal to avoid a deviation from the line of the canal. If this does occur, the tube section when seated will be in a different axis from that of the root canal. This may prevent adequate hand reaming during root treatment.

SUMMARY

A technique is described for the treatment of an upper anterior tooth which has lost its natural crown. It permits the immediate restoration of the root with a temporary crown, and a sterile approach to the root canal during root treatment.

Acknowledgements.—I am indebted to Professor A. C. W. Hutchinson for his help and encouragement; to Lt.-Col. W. P. Baxendine for his good advice; to my colleagues for their useful suggestions; and to Mr. C. E. Chapman and Mr. A. Hunter for preparation of the illustrations.

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DETERMINATION OF ORAL MUSCLE FORCES

By **ROBERT E. PROBST** and **HANS R. MÜHLEMANN**

From the Department of Operative Dentistry and Periodontology, Dental Institute, University of Zürich, Switzerland

MUSCLE forces are one of many factors influencing occlusion. There appears to be an equilibrium between the muscle forces of the tongue, lips, and cheeks. For instance, one has the impression that pronounced cases of Class II with alveolar protrusion are associated with imbalance between the lingual and labial musculature. The need to measure the degree of this imbalance is evident. Therefore measurements of muscle forces have been performed by many authors and with different instruments, such as glossodynamometers (Féré, 1889), cheilodynamometers (Friel, 1924, 1926), ergographs (Manig, 1928; Fellbrich, 1936), myodynagraphs (Alderisio and Lahr, 1953; Margolis and Prakash, 1954), etc. These devices record muscle forces directly (action on levers) or indirectly by the interposition of a hydraulic system. Margolis and Prakash (1954) defined the requirements for instruments measuring oral muscle forces.

Fig. 1.—Micro-dial indicator (C) and forcemeter (A, B) in situ for the measurement of tongue forces. D, E, F, G, Holding apparatus of the micro-dial indicator. H, Self-curing acrylic for the fixation of G.

One of the disadvantages inherent to all measuring devices described hitherto is the fact that muscle forces *per se* were measured and not the forces transmitted to the teeth. The forces acting on hydraulic mouthpieces (Neumayer, 1937; Scott, 1944; Feldstein, 1950; Margolis and Prakash, 1954) or on mechanical levers (Féré, 1889; Friel, 1924, 1926; Manig, 1928; Fellbrich, 1936) but not the forces exerted directly on the teeth were recorded. This is one of the reasons why it was stated (Margolis and Prakash, 1954) that mouthpieces should be of small dimensions, so as to avoid stretching the tissues and unfavourable interference which could be the cause of misinterpreting the amount of muscle force.

The object of this report is to present a very simple instrument which records the forces that are exerted on the teeth during the activity of oral muscles at maximum effort. Some results obtained (Probst, 1954) by the use of this method will also be described.

METHOD

Muscle forces are recorded by using the tooth-mobility (TM) measuring method (Mühlemann, 1951, 1954). The contact point of a micro-dial indicator (*Fig.* 1C; *Fig.* 3 M) is placed perpendicularly to the labial (*Fig.* 1) or lingual (*Fig.* 2 B) surface of the incisors. It is fixed on the lateral teeth by means of a holding apparatus (*Fig.* 1 D, E, F, G, H; *Fig.* 2 C, D, E). The contact point when moved inwards during crown excursions sets in motion the hand on the dial. With the dial fixed on the labial (*Fig.* 1), the patient is asked to push the tongue against the lingual surface of the upper incisors, trying to produce a maximal labial tipping of the crown, the magnitude of which is recorded on the dial indicator (*Fig.* 3 A). After relaxing the tongue, the crown resumes its rest position (*Fig.* 3 B). Then with the lever (*Fig.* 1 B) of a forcemeter (*Fig.* 1 A; *Fig.* 3 D) the same crown is pushed towards the same labial

position as was recorded on the dial indicator when the tongue was pushing. The force necessary to produce this labial tipping with the lever of the forcemeter can be read in grammes on the dial of the forcemeter. This force corresponds to the muscle force that was previously exerted on the tooth. By changing the position of the micro-dial indicator, the forces acting on other teeth can be determined. The same method can be used for measurements of labial muscle forces, the dial indicator being applied to the lingual crown surface (*Fig.* 2). With a half-open mouth the patient is instructed to force his upper lip against the labial surfaces of the upper incisors without extra-oral assistance.

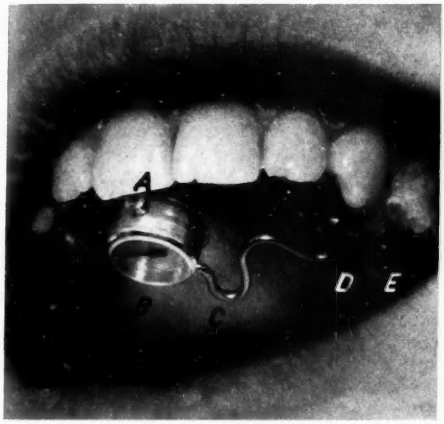

Fig. 2.—Micro-dial indicator (B) in situ for the measurement of lip forces acting on the upper right incisor (A). C, D, E, Holding apparatus.

MATERIAL

A total of 1280 measurements of maximal lip and tongue forces acting on upper incisors were made on 80 teeth of 20 children, 10 to 12 years old, 12 being boys, 8 being girls. Of these 20 children, 9 were pronounced mouth-breathers. All the children had moderate distocclusion (Class II, Div. 1) requiring orthodontic treatment. The forces were determined by the same investigator (Probst, 1954) and under equal conditions at two different times in order to have an indicator of the reliability of the method.

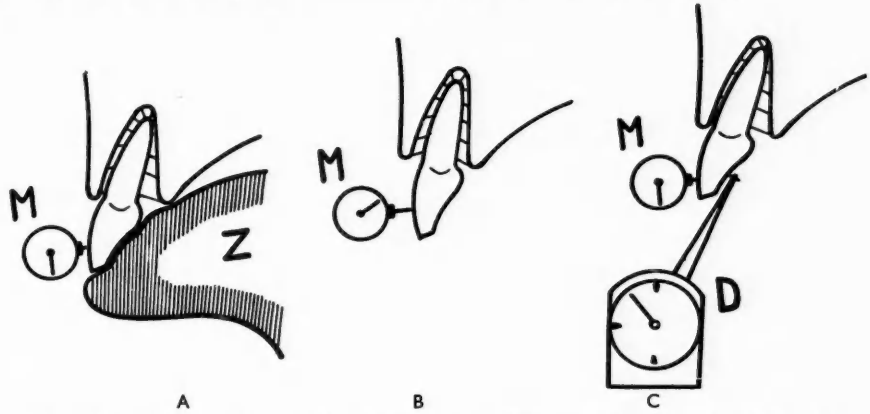

Fig. 3.—Diagram illustrating the determination of tongue (Z) forces. M, Micro-dial indicator; D, Forcemeter.

A, Tongue exerting maximum pressure on the lingual crown surface, tipping the incisor to the labial and moving the hand of the micro-dial indicator to a position that is recorded.

B, Resumption of the incisor to its rest position.

C, Lever of forcemeter (D) tipping the incisor to the same labial position as previously recorded with tongue forces. The force used for the labial tipping is read in grammes on the dial of the forcemeter.

RESULTS

1. The forces at maximum effort transmitted by the lips and the tongue to the upper incisors are summarized in *Table I.* They varied for central incisors between 187 and 198 g., for

lateral incisors between 111 and 134 g. This difference between central and lateral incisors is significant ($P_t < \cdot 001$).

2. The method error of one single force determination (in a sample of 640 determinations) was found to be 7·8 per cent in the case of the tongue and 10·4 per cent in the case of the lip.

Since 8 determinations were performed for one measurement data the error of the resulting mean may be reduced to $1\sqrt{8}$ of the single determination. The calculated errors are thus 2·8 per cent for the tongue and 3·7 per cent for the lip.

The variance of the lip forces determinations proved to be significantly greater than the variance of the tongue force determinations.

This difference may be attributed either to the measuring device or to particular muscular properties.

3. There was a trend to a significant difference ($P_t = 0{\cdot}02$) in the magnitude of maximum lip forces when comparing a group of mouthbreathers ($163{\cdot}4 \pm 13{\cdot}3$ g.) with a group of non-mouthbreathers ($215{\cdot}5 \pm 15{\cdot}2$ g.) (*Table I*).

Table I.—Tongue and Lip Forces in Grammes at Maximum Effort transmitted to Upper Incisors

Source of Force	No. Patients	No. Teeth	Incisors used as Force Indicators			
			$\underline{2}\vert$	$\underline{1}\vert$	$\vert\underline{1}$	$\vert\underline{2}$
Tongue	20	80	$125{\cdot}0 \pm 6{\cdot}4$*	$191{\cdot}7 \pm 7{\cdot}4$	$187{\cdot}9 \pm 8{\cdot}0$	$111{\cdot}5 \pm 4{\cdot}9$
Lip	20	80	$134{\cdot}5 \pm 12{\cdot}9$	$198{\cdot}7 \pm 15{\cdot}6$	$191{\cdot}4 \pm 13{\cdot}9$	$120{\cdot}5 \pm 9{\cdot}3$
Lip	9 (Mouthbreathers)	18		$163{\cdot}4 \pm 13{\cdot}3$		
	11 (Non-mouthbreathers)	22		$215{\cdot}5 \pm 15{\cdot}2$		

* Arithmetic Mean and Standard Error of Mean in grammes.

DISCUSSION AND CONCLUSIONS

Micro-dial indicators used in combination with forcemeters for tooth-mobility measurements can be employed for the determination of the magnitude of forces transmitted to the teeth. These forces may be caused by oral muscles as in the present study, but also by orthodontic appliances. The forces transmitted to teeth by orthodontic springs, elastics, screws, and coils can be measured in many situations by this method.

Our results of recording tongue and lip forces at maximum effort are in the range of those by Scott (1944), Neumayer (1937) and Stiefelhagen (1948). These authors, however, measured tongue and lip *pressure* on the surface of the mouthpiece rubber walls. Scott (1944) found 350 g./cm.², Neumayer (1937) and Stiefelhagen (1948) 180–480 g./cm.².

The lingual or the labial crown surfaces of upper incisors in contact with the lip or tongue during exertion of muscle forces were found (Probst, 1954) to have the following dimensions:—

Labial surface of central incisors	$58{\cdot}5 \pm 2{\cdot}0$ mm.²
Lingual surface of central incisors	$56{\cdot}0 \pm 2{\cdot}0$ mm.²
Labial surface of lateral incisors	$34{\cdot}5 \pm 2{\cdot}0$ mm.²
Lingual surface of lateral incisors	$33{\cdot}7 \pm 2{\cdot}0$ mm.²

If our results of maximal muscle forces (g.) are related to the crown surface on which they were acting, the following pressure values are obtained:—

Tongue pressure on lateral incisors	359 g./cm.²
Tongue pressure on central incisors	339 g./cm.²
Lip pressure on lateral incisors	369 g./cm.²
Lip pressure on central incisors	334 g./cm.²

The advantages of the method presented are:—

1. Its technical simplicity when compared with other methods.

2. Its ability to measure the forces that are acting directly on the teeth and not on interfering mouthpieces or levers.

3. Its small margin of error.

4. Its ability to measure not only oral muscle forces but also artificial orthodontic forces.

The disadvantages seem to be that routine application is seldom possible and that muscle forces cannot be evaluated during normal masticatory function.

SUMMARY

Tooth mobility measurements were used for the evaluation of lip and tongue forces acting at maximum effort on upper incisors. The forces varied between 111·5 and 134·5 g. for upper laterals, between 187·9 and 198·7 g. for upper centrals.

The authors wish to express their acknowledgement to Dr. C. M. E. Eugster, D.D.S., L.D.S. R.C.S., for assistance with the translation.

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Hazards of Dental Fillings under Local Analgesia

The following answer was given to the questions: What are the dangers of possible complications of multiple amalgam fillings under local nerve-block? Can trigeminal neuralgia and pulp damage occur?:—

There is no doubt that the use of local analgesia in the preparation of a carious cavity in a tooth for a filling involves additional risk of damage to the dental pulp. Once a local analgesic has been given the operator is denied one of the most valuable clinical guides to the condition of the pulp—namely, the response to pain—and he must therefore decide before he gives the analgesic whether the pulp is in a vital and healthy condition. The pulp may be damaged by the actual process of cutting, or by the heat produced by a revolving bur. The former is avoided by careful operating and the latter by slow and intermittent cutting or by cutting under a constant stream of cold water.

The advantages of local analgesia for cavity preparation, both for patient and operator, are so obvious that students are taught to use it where necessary but to be aware of and avoid the dangers.

These dangers are increased where multiple amalgam fillings are done under local nerve-block, because of the temptation to cut faster. However, if due precautions are taken, particularly cutting under a stream of cold water, and if all cavities are lined with a non-irritating heat-resisting cement, no trouble should arise.

Toothache or facial neuralgia following fillings may be due to a minute, undetected, exposure of the pulp, but is most likely to be due to overheating. The term "trigeminal neuralgia" is usually reserved for a very severe form of neuralgia of which the cause is not known.—*Brit. med. J.*, 1956, **1**, 1440.

VARIATIONS ON A SCHEME BY ANDRESEN*

By **D. F. GLASS, L.D.S., D.D.O.**

THE name "Activator" covers a considerable variety of appliances which in turn have many different names—Monobloc, Norwegian, and Andresen are only three of the better known.

The simple monobloc activator which employs only the cervicofacial complex of muscles to achieve its results is used in two ways in the treatment of inferior retrusion.

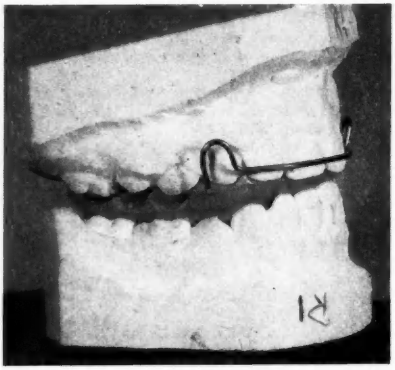

Fig. 1.—Shows monobloc with facets cut to allow upper right maxillary buccal teeth to move distally.

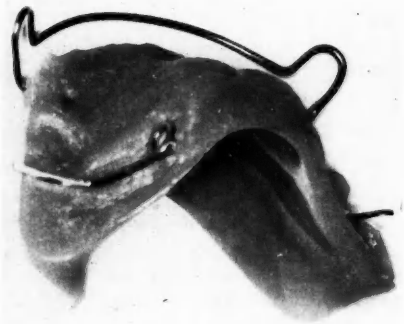

Fig. 2.—Monobloc with springs to move molars distally. Viewed from behind.

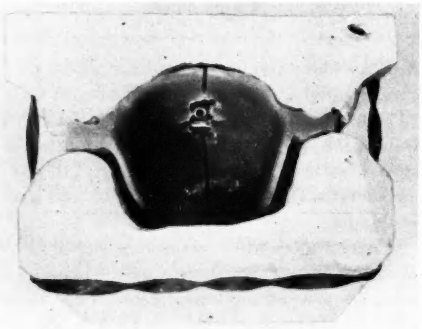

Fig. 3.—Monobloc incorporating expansion screw seen from behind; note the space in the lower half to permit upper expansion only.

Fig. 4.—Shows the divided monobloc united by 1-mm. stainless steel wire bent to permit adjustments.

These appliances range from the completely passive inert monobloc through a scale of elaborations and complications to the skeleton monobloc as described by Bimler.

The facets on the appliance into which the upper and lower teeth fit are cut away to allow distal movement in the maxillary teeth and mesial movement in the mandibular teeth. Erupting teeth are guided into desired positions by means of the correct sloping planes of the tooth facet on the appliance (*Fig.* 1).

* A demonstration shown at the Sheffield meeting of the British Society for the Study of Orthodontics, May, 1955.

A refinement which can be most useful is the addition of molar springs on the activator which move the molars distally into precut facets; this establishes normal molar relationship and assists distal movement of the upper premolars by the cut facets (*Fig.* 2).

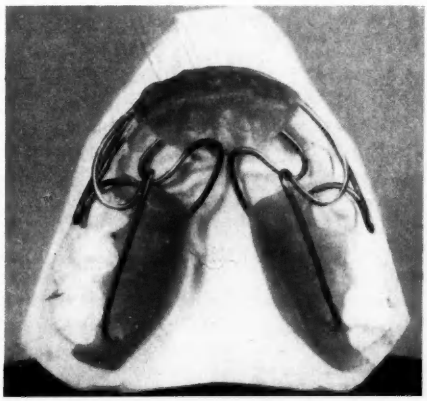

Fig. 5.—Bimler appliance fitted on the upper model as seen from below.

The cutting of facets is not carried out by all operators, and many consider that the best results are achieved without cutting any facets except those to permit normal tooth eruption.

In many cases upper arch expansion is first necessary before intermaxillary traction. This can be achieved by incorporating in the activator an expansion screw or a 1·5-mm. coffin spring.

To avoid expansion of the lower jaw the lower half of the activator is relieved 1–2 mm. on the lingual side of the lower teeth, the whole activator being cut in two as for a simple expansion appliance. In this way upper expansion and intermaxillary traction are possible with one appliance (*Fig.* 3).

The extreme rigidity of the activator is considered by many to be a disadvantage, and less rigid activators which permit latitude of individual jaw movement are becoming more popular. These vary considerably in design and construction; the basic principle is that the two halves, upper and lower, are united by a wire or wires.

Fig. 4 shows a simple type in which the two halves are processed separately and united by a spring or double-U of 1-mm. stainless steel wire. The incisal tips of the lower teeth may be capped and the lower labial arch included.

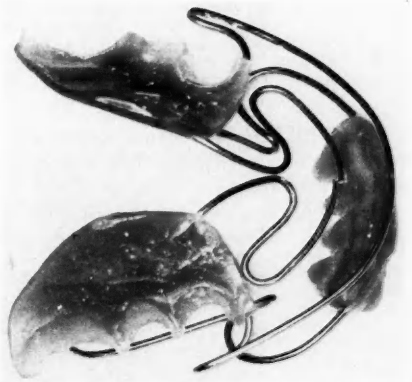

Fig. 6.—Bimler appliance seen from above and right side.

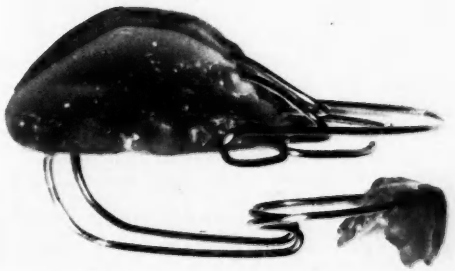

Fig. 7.—Side view of Bimler appliance; note the upper labial arch and the cut lingual arch, also lower labial arch with capping for incisor teeth.

The activator as described by Bimler and its various adaptations seem to be approaching the ideal physiological appliance; they give encouragement to correction and offer gentle persuasive action. A typical Bimler appliance is shown in *Figs.* 5–7.

Thanks are due to Mr. Clementson and the Photographic Department of the Plastic and Jaw Injury Hospital, East Grinstead, for the photographs.

CONGENITAL KERATOSIS OF THE GINGIVA*

By **J. R. TROTT**, B.D.S.

Clinical and Research Assistant, Departments of Periodontology and Pathology, Royal Dental Hospital of London School of Dental Surgery, University of London

CONGENITAL keratotic conditions affecting the oral mucosa are rare and only a few cases have been reported.

Burns (1915) described a case of generalized keratoderma in a boy aged 16 where there was involvement of the eyes, ears, and nasal and buccal mucous membranes. Both parents, three brothers and two sisters were unaffected.

Fig. 1.—Shows the white corrugated appearance of the attached gingiva in the $\frac{567}{}$ region.

In the buccal and nasal mucosæ there was a superficial thickening of the epithelium which closely resembled the clinical picture of leucoplakia. Biopsies taken from the right forearm and back of the neck showed a general thickening of the stratum corneum. In many areas there was a direct transition from the basal to the horny layer, whilst in the corium there was no inflammatory infiltration.

Cannon (1935) reported a case of "white sponge nevus of the mucosa" in a woman aged 38. The epithelium of the cheeks, lips, side of tongue, hard and soft palate, gingiva, and floor of mouth was thickened and showed a peculiar white tint. A similar type of lesion also existed on the labia, vagina, upper part of the anal canal, and rectum. There was a family history of "white mouth", it being present in the patient's son, two sisters and a brother, mother, and maternal aunt. The appearance in the oral mucosa was similar to leucoplakia, but the gingiva showed numerous follicular openings over a greyish-white surface. Biopsy revealed hyperkeratosis.

Ludy and Shirazy (1941) described a similar case in a white female, aged 27, where the oral cavity was the only area involved. Again there was a family history of a similar type of lesion, the patient's mother, maternal aunt, and two sisters being affected, but the father and brother were unaffected. The oral mucosa, including cheeks, gingiva, palate, anterior pillars of the fauces, and the vermilion border of the lips, were "blanched and glistening, as if painted with a film of milk." Parts of this film could be scraped off and it appeared thicker in the morning than in the evening. Biopsy showed an extremely mild leucoplakia, there being keratinization without any malignant changes.

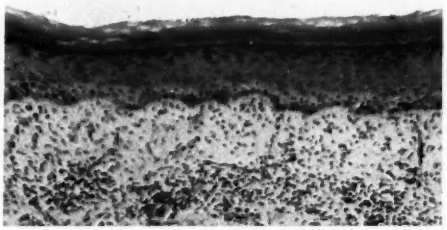

Fig. 2.—A stained section showing hyperkeratosis of the stratum corneum. (H. and E.)

Everett and Noyes (1953) describe 2 cases of "white folded gingivo-stomatitis" which occurred in brothers. The lesion involved the mucosa of the cheeks, the vestibular aspects of the lips, underside of the tongue, and in 1 case it extended slightly on to the gingiva.

* A casual communication to the British Society of Periodontology at the Eastman Dental Hospital, April 9, 1956.

The effect on the gingiva was a papillary hyperplasia and an increase in stippling. Biopsies taken from the cheeks showed a general thickening of the epidermis but no hyperkeratosis, although this had been reported ten years earlier in 1 case.

It can be seen from these four reports that the oral lesion may be part of a more generalized congenital anomaly affecting the skin, it may only affect other similar mucosal surfaces, or it may be limited to the oral cavity. The present case is interesting in that it would appear to be the first report of such a congenital anomaly being localized to the gingiva.

CASE REPORT

HISTORY.—A single woman, aged 28, had noticed a painless rough area on the buccal aspect of the gingiva in the left maxillary molar region, which had been rubbed for a month with boracic acid and honey. She was unaware of any similar lesion elsewhere on the body, or in other members of the family. Oral hygiene was carried out with a hard brush used over the teeth and gingivæ in a rotary manner. The patient was a non-smoker.

CLINICAL EXAMINATION showed a firm, raised white area on the attached gingiva buccally in the $\lfloor\overline{567}$ area (*Fig.* 1). It had an irregular corrugated surface, extended in a linear manner along the gingiva, being approximately 5 mm. × 2 mm. in area, and was more noticeable in the anterior region. It could not be removed with a spatula. A similar, but less pronounced lesion, not rough to palpation, existed in the $\overline{6}\rfloor$ and $\lfloor\underline{6}$ regions on the attached gingiva. Elsewhere the gingiva and oral mucosa appeared healthy, and the occlusion was normal.

HISTOLOGICAL EXAMINATION.—A biopsy from the lesion in the maxillary left gingiva revealed marked hyperkeratosis of the attached gingival epithelium (*Fig.* 2), the stratum corneum accounting for nearly half the total thickness. In the stratum granulosum the nuclei showed pyknotic changes in some areas, but these were often difficult to detect owing to the coarse, heavily staining kerato-hyaline granules present in the cytoplasm. No acanthosis was observed in the prickle-cell layer. There was a well-marked epithelio–connective-tissue junction, but no plasma cells were seen in a slight infiltration of chronic inflammatory cells found at some distance from the basal layer of the epithelium.

CONCLUSIONS AND DISCUSSION

Analysis of the few cases previously reported showed a higher incidence in females, a similar condition having been found in 11 females and 5 males. Everett and Noyes (1953) considered this type of ectodermal dysplasia to be a dominantly inherited characteristic. It is therefore interesting to note that there is no such family history in the present case. The presence and position of the inflammatory infiltration is difficult to explain. If due to surface irritation it would be found immediately beneath the epithelium. Finding it at some distance from this site, however, together with the absence of acanthotic changes in the epithelium, supports the belief that the hyperkeratosis was non-inflammatory in origin.

Clinically, the lesion has not altered in appearance in the past twelve months, and the less noticeable areas in the $\overline{6}\rfloor$ and $\lfloor\underline{6}$ regions are still the same. In the area where the biopsy was taken, scar tissue has been formed.

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The Complications of Gastroscopy and Œsophagoscopy

Several complications can occur following gastroscopy and œsophagoscopy, but the one which is very rare is recorded by the authors—namely, osteomyelitis of the mandible.

A female patient was examined with a Herman Taylor gastroscope under local anæsthesia during the course of investigation of abdominal pain and vomiting. During examination she felt some pain in the floor of the mouth, and for the following four days she had a small abrasion on her left lower gum in the region of molar and premolar teeth which were extracted a few years ago. The abrasion healed and two months later she complained of pain on moving her jaw. A small elongated swelling was noticed on the inner side of the left alveolar margin. The radiographic examination showed a localized area of rarefaction of the bone. The patient received a course of chloromycetin and her symptoms and the swelling disappeared in a few weeks.

It is believed that owing to pressure from the instrument in use a small subperiosteal hæmatoma was produced which became infected.—SMITH, C. C. K., and TANNER N. C. (1956), *Brit. J. Surg.*, **43**, 396.

THE NEW LOOK IN ORTHODONTICS*

By J. H. HOVELL

THERE can be no doubt that present-day "orthodontics" is very different from orthodontics before the war. In fact the very meaning of the word describing our specialty has changed, and when we use it we mean something quite different from the narrow specialty which it used to define.

Let us cast our minds back twenty years for a few moments, and try to recapture the way we thought in those days. Our approach was purely mechanistic: most young orthodontists, and I was myself certainly one of those, were attracted to the specialty because we enjoyed fiddling with wires, and the manual ingenuity and dexterity necessary for the design and construction of intricate appliances. It was those fixed appliances fitted by Miss Smyth, then a newly-appointed demonstrator at the Royal, which drew me into this sphere of dentistry.

It was Edward Angle who was mainly responsible for this purely mechanistic approach. His brilliant mechanical ability plus his dogmatic teaching of the necessity for producing by treatment ideal arches and ideal occlusion led to a complete stultification of orthodontic thought in America, and had repercussions on this side of the Atlantic which even yet have not completely died down. His opponents were regarded as heretics, and in this country it was generally considered that we were far inferior to the Americans, who were the only orthodontists capable of providing first-class treatment.

How far the influence of Angle, and the attitude of mind thus established, retarded true advance in orthodontics it is difficult to say. In those days scientific methods of research and criteria of the results obtained as we use them to-day were developing only in the hands of the few back-room boys, and were still not appreciated by the majority of clinical workers.

Reference to the literature of that period strikingly demonstrates this difference in outlook. For example, in a short section in Bennett's *The Science and Practice of Dental Surgery* (1931) entitled "Diseases associated with Teething", there are no less than sixteen statements commencing "X considers" or "In Y's opinion"; the whole of the remainder of the text is in exactly the same strain without reference to a single scientifically conducted experiment, or series of clinical observations. It was only necessary for a so-called authority to produce a theory, based only upon a few selected cases, or even on only one case, with no controls and no attempts to exclude other possible factors, for it to get into a text-book. Many of these statements pass unchanged into fresh editions and fresh books, and have thus come to rank in the minds of the profession as established facts. An outstanding example of this is the statement that mouth-breathing is productive of underdevelopment of the maxilla and various malocclusions, although, starting with Brash, numerous workers have shown that not only is there no evidence to this effect, but in fact such evidence that we have is entirely to the contrary.

Another example of this uncritical acceptance as facts of statements which were so unsupported that they barely merited being termed theories, is seen in Bennett's classification of malocclusion. A brilliant man, Bennett evolved this classification based upon ætiology, and widely acclaimed at the time by the profession, yet two of the three classes were stated to be due to "developmental defects of bone" without any attempt being made to produce evidence that this was in fact the case.

Now a man must either be very brave or very foolish to make a statement at a meeting of a learned society which is not well supported by facts, and this statement itself cannot be accepted as true until it has been confirmed definitely by other workers.

* Being the Presidential Address to the British Society for the Study of Orthodontics, January 9, 1956.

This change in outlook is not, of course, confined to orthodontics; in fact the reverse is the case. The art of scientific investigation, as it is so aptly termed by Beveridge in his excellent book, has developed most rapidly in the basic sciences and non-clinical branches of medicine.

This is due partly to the difficulty of applying strictly scientific methods to clinical research on humans, and partly to the lack of understanding by the clinical worker of the basic scientific requirements which must be conformed to, if his research is to be valid.

Very careful planning of research is necessary in co-operation with a statistician. Many pieces of work have been rendered quite valueless because of failure to do this. Beveridge's book *The Art of Scientific Investigation* and Bradford Hill's *Principles of Medical Statistics* are two works which must be read, learned, and inwardly digested by any aspiring young research worker as an essential first step towards his goal.

Of all the branches of science, orthodontics was the slowest to conform to these universally accepted standards—for many years, indeed until after the war, it was hardly more a science than is the medicine of the African witch-doctor.

However, important and essential as the scientific and statistical method is in the establishment of facts, this is work that can be done by any intelligent worker with the requisite basic knowledge and training. A piece of research cannot just be started out of the blue; it must have a definite objective. As Darwin said: "All observation must be for or against a view if it is to be of service." There is a small class of research workers who have the uncommon quality of being able to grasp the significance of the unusual, an idea which was stressed by Walshe when he said that "It takes the exceptional mind to pass beyond the first exercises of the discriminating tendency to pick up a hitherto unrecorded phenomenon and to grasp its significance. Indeed, many a competent clinician may live out his professional existence, never having made a truly original observation."

Spence makes exactly the same point in dividing clinical observation into three main categories:—

1. Observation of the established signs of disease which act as a guide in diagnosis and prognosis.

2. Recognition of new phenomena or new correlations between previously observed phenomena. This is rare and is the attribute of the truly brilliant research worker. In medicine one can cite the discovery by Gregg of the association of maternal rubella between the eighth and tenth weeks of pregnancy, with certain congenital deformities.

We are fortunate in this Society to have as members two such men—I refer, of course, to Ballard and Rix, both of whom, working independently, recognized the importance of soft-tissue behaviour and morphology relative to the shape and relationship of the dental arches.

3. Planned clinical observation—this is work for the trained research worker and must follow the observations of the preceding category.

Huxley stresses the importance of the original and perhaps heterodox observation, when he says: "Those who refuse to go beyond fact rarely get as far as fact. Almost every great step in the history of science has been made by the invention of hypotheses which often had very little foundation to start with."

Ballard and Rix were fortunate that they produced their ideas at a time when the orthodontic profession in this country was ripe to receive them, and when the development of cephalometry as a purely mechanical research tool has enabled many of their views to be substantiated and expanded. Every new idea now, as always, has to be fought for against what Bernal calls the "regressive forces of pedantry and obscurantism". It must be remembered that in the third century B.C. Aristarchus taught that the earth rotates around the sun and upon its own axis, for which view he was charged with impiety! Mendel's famous experiments lay forgotten for many years, until they were rediscovered when the scientific world was ripe for them.

One last word about the research worker, and again I quote Bernal: "No scientist can be, nor can he seriously want to be, guaranteed against reversals of judgement in the long run. All he can hope for is to establish enough valid and significant connexions between facts, even if they are later overthrown, to serve as a basis for finding new facts and new connexions. The greatest difficulty in discovery is not to make the necessary observations but to break away from traditional ideas in interpreting them."

With regard to the work of Ballard and Rix, we are now at the point when the second category of research worker must get going, and establish by large-scale scientific investigation the validity or otherwise of their assumptions. So far there is to support them a great mass of clinical evidence, both in children and adults, dentulous and edentulous, and also the fact that treatment based upon their views gives the results that would be expected. In addition, many causes of relapse, hitherto unexplained, and varying responses to treatment, fall neatly into place when viewed against the background of soft-tissue morphology and behaviour.

All this, however, is not sufficient; we still must consolidate this position by the accepted scientific method. Only this year, at the E.O.S. Congress, I was asked by Lundstrom why we had not done this in view of the fact that we felt so certain of the fundamental importance of this aetiological factor. What a field there is at the moment for the young orthodontist! In almost every case I see, every clinical demonstration I give at hospital, some point arises, the elucidation of which could provide a piece of work, often not on too large a scale, which would be excellent training for any young man prepared and able to devote the time and energy to its prosecution. This is indeed a change. When I was a young man wishing to take up research, I tried to obtain advice and help from my seniors, without avail. It was not that they were unwilling to help, but that the purely empirical nature of orthodontics, and the unscientific training and outlook in dentistry at that time, had resulted in complete sterility of thought—the mechanical field had been exhausted—Friel had left nothing for anyone else; the scientific field was still to be opened up.

This new outlook, with an ever-increasing search for basic aetiological factors has immensely widened the scope of orthodontics, so that not only is it now the foundation stone upon which most dental knowledge is and education should be built, but it impinges upon many non-medical branches of science. I would like to mention a few of the ramifications of orthodontics, both inside and outside dental surgery. Let us take periodontology to start with. Both Ballard and myself have read papers pointing out a possible relationship between periodontal disease, malocclusion, and abnormal orofacial behaviour patterns. Many periodontologists deny this relationship, others consider it important, but from a lack of fundamental orthodontic knowledge fail to conduct essential research along scientific lines. I think there is no doubt that in the future a knowledge of the basic principles now being investigated and established by orthodontists, will be equally necessary for a periodontologist. Periodontology has not yet fully emerged from the empirical unscientific stage. Long words such as paradontosis and periodontoclasia are invented to describe clinical conditions and complete classifications, but knowledge of aetiology is sadly lacking, and will continue to be while the minds of periodontologists are concerned mainly with toothbrushes and mechanical procedures.

Prosthetics equally demands a knowledge of orofacial behaviour. Many years ago Fish produced his well-known technique for stabilizing the lower denture, based entirely upon muscle balance. Had he been an orthodontist, he might have gone further and been the first dental surgeon to describe variations in the orofacial behaviour patterns. These patterns persist unchanged in the edentulous adult and a knowledge of the displacing forces produced by the various types is essential for the full denture prosthetist.

In major oral surgery undertaken for correction of variations of the facial skeletal pattern, ignorance of the basic principles of

muscle balance and soft-tissue morphology may lead to incorrect diagnoses and ill-conceived surgical procedures.

Indeed, apart from the aetiology of caries, a knowledge of orthodontics, or perhaps I should say functional dental anatomy and physiology, is a first essential. Even single restorations improperly designed can, as has been shown by Beyron, throw the whole masticatory apparatus out of gear and ruin the health of the supporting structures of the teeth.

In a communication given at our Country Meeting in Sheffield last year, Ballard opened up a new field by showing the possible significance of behaviour patterns in animals with regard to orofacial behaviour, and drawing analogies between the two. He stressed the endogenous nature of the development of maturation patterns during ontogenesis and drew phylogenetic parallels. Psychologists, zoologists, and anthropologists have already found a subject of common interest in the study of displacement activities in animals and imprinter mechanisms in the maturation of behaviour. There seems to be little doubt that with regard to the results of animal experiments there is a similarity so close to the development of nervous disorders in humans, that similar neuropsychological mechanisms are certainly at work.

Let us look at a few examples taken from Russell's lecture in the *Scientific Basis of Medicine* Series. Psychological or nervous breakdown can be produced in animals by placing them experimentally in circumstances leading to conflict. On the ringing of a bell, dogs were shown either an ellipse or a circle. Subsequent to seeing the circle they were always fed, never after the ellipse. This produced a conditioned reflex of salivation on seeing a circle, and inhibition of salivation with the ellipse. When this reflex was fully established, the circle was made slightly elliptical and the ellipse more circular. At first the animals could differentiate between the two and the normal conditioned response occurred. As the shapes of circle and ellipse became more similar, a point was reached in which the dogs could not differentiate between the two, resulting in frustration and complete nervous breakdown. Exactly similar situations are shown by psychiatrists to result in nervous breakdowns in humans.

Rats subjected to frustration produce a behaviour pattern of strikingly rigid fixity. When confined in a cage with two doors, one unlocked leading to food and one locked, they soon learn at a given signal to jump at the unlocked door. If the position of the locked door and unlocked door is now switched at random, the result is usually a fixation upon one given door which is always jumped at. It is now found that this behaviour pattern is so firmly fixed, that it is difficult and may even be impossible, to re-educate the rat to jump at a given unlocked door—before the development of this fixation a simple matter. An analogy between this behaviour in animals and thumb-sucking and possibly atypical swallowing actions, can be seen.

Quoting from Russell, behaviour disorders are thus produced under conditions in which some occurrence, possibly itself environmental, interferes with the adjustment of an organism to environmental or organic changes. There are two main types of occurrence. In one the obstruction is such that the organism lacks the ability to overcome it—frustration resulting in fixation of behaviour; in the other inability to differentiate between stimuli giving rise to incompatible responses leads to conflict. For example, artificially nourished puppies and calves restrained from nipple-sucking may develop abnormal behaviour patterns of licking paws, other dogs and inanimate objects to a degree which is sometimes harmful.

The genetic background which modifies the effects of conflict and frustration is shown by the experiment in which selective breeding of rats produced two strains, the one highly stress-resistant and the other very susceptible to stress.

It is probable that an orthodontist could do much valuable work in collaboration with a biologist and a neuropsychiatrist along these lines. The criticism has been made that man is not an animal—unfortunately he is—hence most of our trouble. I am sure that Ballard's phylogenetic approach to disturbances of behaviour is the correct one, and again quote

Russell, who says: "Many investigators take a comparative phyletic approach to this work. This is necessary in many branches of biological and medical research owing to limitations on the use of man as a subject. Such research involves extensive observation of homologous behaviour patterns in a variety of forms, which may lead to the discovery of general principles. Care is needed in assessing results and applying them to man, but much research of this type has in the past yielded outstandingly valuable results."

Clinical observation leaves little doubt that sucking habits are often found in children of a definite neuropsychological type, and are also commonly associated with variations from the normal swallowing action. Ballard's tentative observations, which at first sight appeared somewhat remote from orthodontics, are found on deeper study to have opened up a field for research far beyond the original frontiers of our specialty, which may well lead to the discovery of facts of great importance and aetiological significance.

With regard to imprinter mechanisms and displacement activities, we are on ground even less fully explored. There appears to be little evidence at present that these mechanisms, whose effect is so ably described by Lorenz, Tinbergen, and others, in guiding and organizing development of behaviour in animals act in the same way in humans. Study of behaviour in humans is much more difficult owing to the influence of intelligence in masking or perhaps even controlling innate behaviour patterns. I quote, however, from a letter received from S. A. Barnett, of the Zoology Department, Glasgow, to whom I wrote on this subject. He says: "It seems very likely that there is a fundamental connexion, in terms of nervous function, between displacement activities and the behaviour patterns of children which you mention. The main problem as I see it at the moment is to devise methods of study which could establish such homologies empirically."

What an enthralling field for research is opened up by this particular "new look".

I will turn now from the sublime, if not to the ridiculous, at least to the more mundane aspect of orthodontics—that is orthodontics in the Health Service. Here again a revolutionary change has occurred. In the past orthodontics was a branch of dentistry which to the general practitioner was to be avoided at all costs. The growing tooth-consciousness of the general public, added to pecuniary encouragement of the Health Service itself, has changed all this. Most general practitioners, some willingly, some unwillingly, undertake a varying amount of orthodontic work in their practices. The hospitals and few school orthodontic clinics just cannot cope with the demand, so that waiting lists reach such a length as to become a mockery.

When one considers the changes in orthodontic thought that have evolved during the last ten or even five years, it is not surprising that quite apart from their lack of experience in techniques, the majority of men who qualified longer ago than this, have no knowledge of the basic principles underlying correct diagnosis: and without correct diagnosis correct treatment planning is impossible, or at the best is empirical and a matter of chance. Please do not think I am running down these general practitioners, who like the general medical practitioners, are the backbone of their profession: it is no fault of theirs that a changing social system has left them high and dry. Nevertheless something has got to be done about it. I can well imagine what a headache this set-up gives the Dental Estimates Board. They are acting as guardians of the country's money—of our money—and are in reality controlled by the Treasury rather than the Ministry of Health.

Having worked on Replanning and Establishment Committees and a hospital Board of Governors, I know well that when the Treasury through the Ministry allots a certain amount of money for a certain purpose, that sum just cannot be exceeded. The Dental Estimates Board is in the position of having to allot the limited sum of money at its disposal to the best possible advantage of the British people. I have no inside knowledge of the workings of the D.E.B., but by what Ballard calls "inductive reasoning" it is quite obvious that a high proportion of the treatment plans they

receive must be doomed to failure or ultimate relapse, in fact at hospital one is often called upon to give second opinions upon cases of this type. One case seen recently was a severe Class II, Division 1 malocclusion with crowding of the teeth upon a postnormal dental base relationship, in a girl of 16 years of age. The treatment recommended was upper and lower expansion followed by an Andresen appliance. The Dental Estimates Board, in a polite and tactful letter, suggested that in their experience such treatment at this age in this type of case was unlikely to prove successful, and would the dental surgeon in question consider extraction in treatment. The dental surgeon in question sent the case to me with an indignant letter, asking me to uphold his professional judgement, which, however, I was quite unable to do. I think it is significant that in the increasing number of cases being sent to me, as a result of a request from the D.E.B. for a second opinion, in not one have I been able to agree with the original treatment plan, in spite of my desire to support my professional colleagues whenever possible.

It is my impression that orthodontic cases are only turned down, held up, or queried in cases in which the treatment plan is not merely questionable, but obviously incorrect. It must be remembered that the Board has an orthodontic consultant to give advice in these cases. The Board also knows by now, as a result of experience, which practitioners are actually producing good stable results in treatment, and which are in fact only wasting the country's money and the patient's time. The only weapon they have against the latter group, and it is in the country's and the patient's interest that it should be used, is the use of red tape with delays, quibbling, and all the petty annoyances and resentment which is thus engendered: they are not permitted to query the dental surgeon's professional judgement, and the latter himself is almost always acting in good faith and becomes rightly aggrieved at the way the proceedings are carried out.

This is a most unsatisfactory state of affairs, and it is evident that the Ministry is well aware of this by recent action that has been taken. It was originally envisaged that specialist treatment, such as orthodontics, should be carried out in hospitals and health centres by specially trained staff under consultant guidance. The trainee specialist scheme was introduced so that future consultants could be trained along the right lines to be able to take charge of these teams. We have now reached the time at which this scheme is maturing—an adequate number of young men have progressed up the trainee ladder and are now ripe for such appointments. Unfortunately, the heavy hand of the Treasury has again intervened. There is not enough money available for the building and staffing of health centres to absorb these men and carry out the treatment.

The Ministry has shown its awareness of the urgency of this problem by recent memoranda to Hospital and Regional Boards, stressing the advisability, in fact the urgency, of creating consultant appointments in Orthodontics. Even in this respect their hands are tied by the Treasury—that is to say, by the financial resources of the country; we are already taxed quite highly enough; and these Hospital and Regional Boards in most cases have to find the money for these new appointments from their own allotment of Treasury funds, by means of economies elsewhere. Progress is, therefore, necessarily slow.

Also, owing to the altered circumstances, the duties of such a consultant are necessarily different from those originally envisaged. He is not to have a staff of specially trained dental surgeons and trainee specialists working under him. He is virtually on his own. How, then, can he best serve the community and the profession! I think it is by making good to the best of his ability the deficiencies in orthodontic knowledge of the general practitioners in his area, so that they themselves are able to carry out under his supervision and guidance, basic orthodontic treatment for all but the most difficult cases. This means that he himself will have little time for actual treatment, although in my opinion he must as it were keep his hand in by doing a certain amount of treatment, say the equivalent of three sessions per week, for the rest of his

consultant career. He will have to organize study circles and postgraduate courses in his area. This may involve travelling and a considerable amount of work outside normal working hours. He must keep actively in touch with every dental surgeon in his area, whom he can persuade to co-operate with him, giving advice wherever necessary, and initially probably carrying out the treatment planning for almost all cases.

It is going to be hard and uphill work, but interesting and rewarding. In my opinion, such posts when created, should go to the young energetic men who have been specially trained for this work under the trainee specialist scheme; there are many of them waiting for jobs and well capable of filling them. Under these circumstances I believe it to be contrary to public and professional interest to appoint to such a post any man of over 40 years of age, however eminent.

So far I have spoken of the effects of past educational methods, adapted to the needs and knowledge of the time upon present-day requirements. It becomes obvious that with the present set-up—one which in view of purely financial limitations is likely to last indefinitely—the education of the student and the requirements of the qualifying bodies must be adapted to the needs of the profession and our patients. In this respect I have just completed, in a career full of changes of mind, what I consider to be my most complete *volte-face*. It has always been my view that orthodontics should be a postgraduate subject and that for the undergraduate instruction should be confined to the essentials of aetiology diagnosis, and treatment planning—treatment as such should be omitted almost certainly.

The reasons for my change of opinion are twofold. First is my conviction that the basic principles of orthodontics are the basic principles of dental surgery as a whole, and therefore must be taught and understood by the undergraduate if he is to develop into a first-class dental surgeon. Second is the very definite need now for the general practitioner to be able himself to carry out orthodontic treatment for his patients.

When I was a B.D.S. examiner with Rix, we cut out the practical part of the examination. I have a feeling now that we were wrong in so doing and that there is a good case for re-introducing this. With regard to the L.D.S. examination, because there is no special orthodontic section, and no orthodontists upon the board of examiners, candidates know full well that no knowledge of orthodontics whatsoever is necessary in order to pass their final examination. This is a very bad thing, because these students are thus encouraged to ignore in their studies a vital and essential part of dental surgery, without knowledge and comprehension of which they are only too likely to remain at the level of pure technicians—a criticism which has only too often been levelled at dental surgery by our medical colleagues.

I think that the College should—in fact must—take notice of this state of affairs, and so change the requirements of the final L.D.S. examination to bring it into line with the B.D.S. The new Dental Bill, with its significant section upon the training of ancillaries, foreshadows great changes in the dental profession of which we must be aware, and of which we must make use, if we are to maintain and in fact improve our status. By the possibility of relieving us in the future of much of our purely routine mechanical work, the Bill offers the dental profession a unique opportunity of rising above the level of pure technical achievement, to becoming a prescribing profession, on the level if not of medicine at least of surgery.

Here is our big opportunity; we must grasp it with both hands, and it lies I think with orthodontics, the most scientific and progressive branch of dental surgery at the moment, to make possibly the greatest contribution towards the future of dental surgery.

It is to be hoped that the regressive forces of pedantry and obscurantism within the body of dental surgery do not, in a vain endeavour to stem the tide of advance, prevent us from using to the full the opportunity that has been presented to us.

I have tried to show that the "new look" in orthodontics is not just a change in ideas of aetiology and in philosophies of treatment, but

goes much deeper. It is a radical change in our professional outlook which must spread to all branches of dentistry, raising it from a purely *ad hoc* technical skill to its proper place amongst the scientific and learned professions. The opportunity is now ours and we are capable of grasping it, and I feel and think that we shall do so.

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DISCUSSION

Mr. D. P. Walther said he would like to congratulate Mr. Hovell on his election as President of the Society and to thank him for the New Look which he had given the Society in this New Year. It was a magnificent New Look, full of great opportunity and hope and indicating a great future. Mr. Hovell had certainly put a great deal of time, hard work, and his usual boundless energy into his New Look and had drawn from his vast personal experience.

He liked the title of the address and had immensely enjoyed the address itself, which he had found very encouraging. It had brought home to him what a tremendous amount of research work had yet to be done and what a wide and fascinating field was open to orthodontists.

The President had traced very clearly the progress of orthodontic thought up to the present time. He wholeheartedly agreed with the President that orthodontists were now just on the brink of what was quoted in the address as Spence's Category 3. From Category 2 they had been presented with numerous theories which seemed quite logical in certain cases, but there was still a vast amount of work to be done.

He had been delighted to hear the President say: "We are now at the point when the second category of research worker must get going and establish by large-scale scientific investigation the *validity* or *otherwise* of their assumptions."

The President had also stressed, he thought very wisely, that this large-scale clinical research must be well planned and must be undertaken by suitable personnel who had been well trained in scientific research methods, including, of course, statistics. He hoped that in time, therefore, the science of orthodontics would be raised higher than the medicine of the African witch-doctor. Seriously, however, although there was still a great deal of research to be done, orthodontists must be very grateful for all that had been done in the past.

He had been pleased to hear the President say that orthodontics was now the foundation stone upon which most dental knowledge and education should be built. He felt with the President that many periodontologists, prosthetists, and others might well derive great benefit from attending some of the Society's meetings, as in fact it did orthodontists a world of good to attend theirs.

He had been extremely interested in the President's views on orthodontics under the National Health Service. He agreed with the President that the Dental Estimates Board had a very difficult task to perform. The President had given a very clear picture of what was going on. It was a good thing that the Ministry realized the importance of the orthodontic problem, and he hoped it would not be long before the requisite money was forthcoming. It was very important to have orthodontic consultant appointments if the trainee specialist ladder was to be maintained.

The President had concluded his address very courageously by describing his change of attitude towards undergraduate orthodontic instruction. What the President had said in that connexion was very true indeed, and he hoped that both the College and the University would take notice of what the President had said and would do something about it.

Orthodontic teaching was essential in the training of the specialists and consultants, and there should also be refresher courses to keep general practitioners up to date and to help others to carry out treatment under consultant advice. The teaching of orthodontics should take a higher place in the undergraduate curriculum, and it could do this only by the whole course being lengthened or by the amount of time devoted to other subjects being reduced. He thought the time had now come for a thorough revision of the whole dental syllabus.

In conclusion, he would like to thank the President for his most enjoyable address and to wish him a very happy and successful year in office.

Mr. N. J. Ainsworth congratulated the President on his address and said it was a remarkable fact that it was the first orthodontic address every word of which he had understood and the sentiments in which he heartily endorsed.

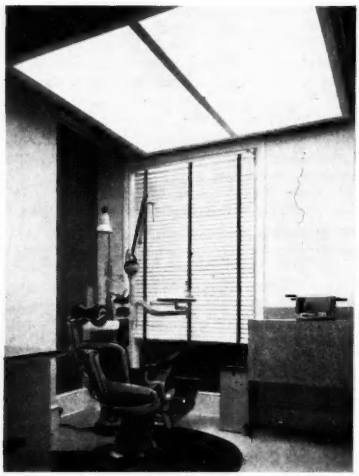
The meeting then terminated.

Barium Sulphate and Antibiotic Mixture in Pulpotomy

Neither dry barium sulphate nor a mixture of barium sulphate and Grossman's antibiotic paste produce inflammation when placed in direct contact with pulpal tissue. Under both a denture bridge is produced which is comparable with that produced under calcium hydroxide. It is suggested that the paste might be an effective dressing in pulpotomies on cariously exposed pulps, and that artificially placed calcium ions in contact with pulpal tissue are not necessary for the production of a denture bridge in a pulpotomized tooth.—VIA, W. F., *J. Dent. Child.*, **22**, 195.

NEW LIGHTING SYSTEM IN DENTAL SURGERY

A SHADOW-FREE lighting system, with an intensity of 100 lumens/sq. ft. at working height, and known as a Lumenated Ceiling, is in the form of a false ceiling of translucent



corrugated vinyl sheet suspended in a lightweight steel framework. The lamp arrangement is housed in the cavity between the false and true ceilings so that, in effect, the Lumenated Ceiling appears to become the source of illumination.

The surgery installation, designed to meet the special requirements of the dental surgeon, utilizes a false ceiling, 6 ft. square, erected immediately above the dental chair. Strips of hardboard 1 ft. wide, fixed from the perimeter of the framework to the true ceiling, form a lightproof cavity. Illumination is provided by six 5-ft. 80-watt white fluorescent tubes.

TURNER DENTAL SCHOOL, UNIVERSITY OF MANCHESTER

The second F. C. Wilkinson Commemoration Lecture will be delivered by Emeritus Professor H. F. Humphreys, a former Vice-Chancellor and Principal of the University of Birmingham, on Oct. 19, 1956, at 5.30 p.m. in the Arthur Worthington Hall, Dover Street, Manchester.

During the day a Clinical Meeting will be held in the Turner Dental School, followed in the evening by a Reunion Dinner. All past Manchester Dental Students are invited and any wishing to attend who have not received personal notification should communicate with the Secretary (Clinical Meeting), Turner Dental School, Bridgeford Street, Manchester, 15, before Sept. 10.

TEACHERS OF PERIODONTOLOGY

THE sixth meeting of the Teachers of Periodontology in the United Kingdom was held at the Eastman Dental Hospital on May 2, 1956. Dr. E. Bradford was in the Chair and for part of the proceedings we were fortunate to have the company of Dr. Jens Waerhaug, from the Institute of Dental Research, Oslo.

Mr. W. G. Cross opened the proceedings by discussing the advances made during the last year in the production of tungsten carbide hoes and curettes in this country. He was optimistic that during the next year satisfactory hoes and curettes would be manufactured for the United Kingdom market. It was also generally agreed that Blake's gingivectomy knife should be part of the undergraduate's instrument kit.

Discussion ranged far and wide over two abstract subjects, research and the teaching of periodontology in a general dental clinic. With regard to the former, it was felt that the present teachers were not allowed sufficient time off from their teaching duties to carry out much research, and also that there were not sufficient junior staff appointments to ease the strain on the teaching side and allow research to be carried out.

Most of the teachers felt that the teaching of periodontology would be best carried out in a general dental clinic, but at the present moment the physical construction of most of the dental schools made departmentalization a necessity.

The teaching of scaling on a phantom head was discussed at length, but no satisfactory arrangements to suit all requirements could be

achieved. Some felt that the patient was probably the best place to teach scaling, but all agreed that few students reached proficiency in this aspect of periodontal therapy owing to the limited amount of time spent on periodontology. It was interesting to hear that scaling was being set as part of the final practical examination in many dental schools. Finally it was felt that there was a great need for an undergraduate book in periodontology for this country.

The next meeting of teachers will be held at Newcastle in 1957, on the occasion of the Annual Meeting of the B.D.S.

NATIONAL HEALTH SERVICE NOTES

Remuneration of Senior Hospital Dental Officers

As from April 26, 1956, the salary scales applicable to Senior Hospital Medical Officers shall apply to Senior Hospital Dental Officers.

(i) Main scale:—
£1575×£50 to £2025 per annum.

(ii) Scale for those appointed at age 30 or less:—
£1475×£50 to £2025 per annum.

(iii) Scale for those appointed at age 31:—
£1525×£50 to £2025 per annum.

GENERAL DENTAL COUNCIL

At the first meeting of the General Dental Council held on July 4, 1956, Sir Wilfred Fish, C.B.E., M.D., F.D.S. R.C.S., was unanimously elected to be the first President of the Council.

Mr. F. J. Ballard, O.B.E., and Mr. J. E. H. Duckworth, M.C., L.D.S., were elected to be the first Treasurers until the end of the session of the Council in November, 1957.

LIST OF MEMBERS
July, 1956

Nominated by Her Majesty, with the advice of Her Privy Council, or on the recommendation of the Governor of Northern Ireland:

T. H. J. Douglas, Esq., C.B.E., F.R.F.P.S., F.D.S. R.C.S., 14 Belgrave Rd., Corstorphine, Edinburgh, 12.

Sir Wilfred Fish, C.B.E., M.D., F.D.S. R.C.S., Royal College of Surgeons of England, Lincoln's Inn Fields, London, W.C.2.

Dr. W. G. Senior, C.B.E., F.D.S. R.C.S., Ministry of Health, London, W.1.

P. S. Noble, Esq., King's College, London, W.C.2.

Miss F. Rees, 29B The Parade, Cardiff.

J. Shuttleworth, Esq., O.B.E., Ministry of Health and Local Government, Stormont, Belfast.

J. M. Vallance, Esq., 11 Glenorchy Terrace, Edinburgh, 9.

Nominated by University of Birmingham:

Professor A. B. MacGregor, M.D., F.D.S. R.C.S., Medical School, Hospitals Centre, Birmingham, 15.

Nominated by University of Bristol:

Professor A. I. Darling, M.R.C.S., L.R.C.P., M.D.S., F.D.S. R.C.S., The Dental Hospital, Bristol, 1.

Nominated by University of Durham:

Professor R. V. Bradlaw, C.B.E., F.R.C.S., F.D.S. R.C.S., The Dental Hospital, Newcastle upon Tyne, 1.

Nominated by University of Leeds:

Professor T. Talmage Read, F.R.F.P.S., F.D.S. R.C.S., The University, Leeds, 1.

Nominated by University of Liverpool:

Professor H. H. Stones, M.D., M.D.S., F.D.S. R.C.S., School of Dental Surgery, The University, Liverpool, 7.

Nominated by University of London:

Professor M. A. Rushton, F.D.S. R.C.S., Guy's Hospital, London, S.E.1.

Professor F. C. Wilkinson, C.B.E., M.D., F.D.S. R.C.S., Institute of Dental Surgery, Eastman Dental Hospital, London, W.C.1.

Nominated by University of Manchester:

Professor H. G. R. Radden, D.D.Sc., F.D.S. R.C.S., Turner Dental School, The University, Manchester, 15.

Nominated by University of Sheffield:

Professor G. L. Roberts, M.B., Ch.B., F.D.S. R.C.S., Department of Dental Surgery, The University, Sheffield, 10.

Nominated by University of Edinburgh:

Professor A. C. W. Hutchinson, M.D.S., F.D.S. R.C.S., 31 Chambers Street, Edinburgh, 1.

Nominated by University of Glasgow:

Professor J. Aitchison, H.D.D., F.D.S. R.C.S., The Dental Hospital, Renfrew Street, Glasgow, C.3.

Nominated by University of St. Andrews:

Professor A. D. Hitchin, M.D.S., F.D.S. R.C.S., The Dental Hospital, Park Place, Dundee.

Nominated by Queen's University of Belfast:

Professor P. J. Stoy, B.D.S., F.D.S. R.C.S., The Dental Department, The Queen's University, Belfast.

Nominated by University of Dublin:

Professor E. S. Friel, M.Dent.Sc., F.D.S. R.C.S., 3 Fitzwilliam Place, Dublin.

Nominated by National University of Ireland:

Professor F. J. Dunkin, M.B., B.Ch., B.D.S., 10 Upper Fitzwilliam Street, Dublin.

Nominated by Royal College of Surgeons of England:

Sir William Kelsey Fry, C.B.E., M.C., F.R.C.S., M.D.S., F.D.S. R.C.S., Institute of Dental Surgery, Eastman Dental Hospital, London, W.C.1.

Nominated by Royal College of Surgeons of Edinburgh:

F. G. Gibbs, Esq., F.R.C.P., F.R.C.S., F.D.S. R.C.S., Barbreac, Pentland Avenue, Colinton, Edinburgh, 13.

Nominated by Faculty of Physicians and Surgeons of Glasgow:

W. M. Gibson, Esq., M.B., Ch.B., F.R.F.P.S., F.D.S. R.C.S., 18 Broompark Drive, Newton Mearns, Glasgow.

Nominated by Royal College of Surgeons in Ireland:

R. B. Dockrell, Esq., M.B., B.Ch., M.Dent.Sc., 3 Fitzwilliam Place, Dublin.

Elected by dentists whose addresses in the Dentists Register are in England (excluding the County of Monmouth), the Isle of Man, or the Channel Islands:

F. J. Ballard, Esq., O.B.E., Dentists Act, 1921, 47 Okehampton Road, Willesden, London, N.W.10.

J. A. F. X. Bell, Esq., L.D.S., 1 Galloway Road, Waterloo, Liverpool, 22.

J. P. Cocker, Esq., L.D.S., F.D.S. R.C.S., 28 Bond Street, Wakefield, Yorks.

R. R. Course, Esq., L.D.S., F.D.S. R.C.S., 15 Agincourt Road, London, N.W.3.

J. E. H. Duckworth, Esq., M.C., L.D.S., 56 Hendon Lane, London, N.3.

K. Malik, Esq., L.D.S., M.R.C.S., L.R.C.P., 77 Nile Street, East Road, London, N.1.

E. Samson, Esq., L.D.S., F.D.S. R.C.S., 7 Poole Road, Bournemouth, Hants.

Elected by dentists whose addresses in the Dentists Register are in Wales (including the County of Monmouth):

R. O. Hellier, Esq., L.D.S., 90 Holton Rd., Barry, Glam.

Elected by dentists whose addresses in the Dentists Register are in Scotland:

J. M. Banks, Esq., L.D.S., 8 High Street, Renfrew.

D. MacGregor, Esq., F.D.S. R.C.S., 15 Manor Place, Edinburgh, 3.

Elected by dentists whose addresses in the Dentists Register are in Ireland:

J. Lyons, Esq., F.D.S. R.C.S., Moore House, Donegall Place, Belfast.

Additional members nominated by the General Medical Council:

H. J. B. Atkins, Esq., M.Ch., 27 Chester Terrace, London, N.W.1.

Sir Harold Boldero, D.M., F.R.C.P., 39 Hill Street, London, W.1.

Professor R. J. Brocklehurst, D.M., Department of Physiology, The University, Bristol, 8.

Professor R. B. Green, M.B., F.R.C.S., The Medical School, King's College, Newcastle upon Tyne, 2.

R. A. Stoney, Esq., F.R.C.S.I., 56 Fitzwilliam Square, Dublin.

Professor W. J. Tulloch, O.B.E., M.D., University of St. Andrews, Medical School, Dundee.

BOOK REVIEW

DENTAL MECHANICS FOR STUDENTS. By JOHN OSBORNE, Ph.D., M.D.S., F.D.S. R.C.S., Professor of Dental Prosthetics, University of Birmingham. Fourth edition. $8\frac{1}{2} \times 5\frac{1}{2}$ in. Pp. 446, with 293 illustrations 1955. London: Staples Press Ltd. 40s.

This work has now become a standard and the appearance of a revised fourth edition is a welcome event. The greater part of the book is devoted to the mechanical side of prosthetic dentistry and the layout of the subjects forms an admirable progression for the student of these matters. Standard preliminary techniques are first dealt with and lead up to the setting up of full dentures. Then follows a highly condensed and informative section on the design of partial dentures and a chapter on the assemblage of the elements that go to make the complete partial, the function of each part being described and analysed. From this the author goes on to consider processing and writes in detail of the materials used as denture bases, their properties, and the manner in which they are dealt with in the workshop. Included in this section is an account of the chrome-cobalt alloys and a comparison of their properties with those of the other metallic bases. The book ends with a series of chapters dealing with sundry techniques concerned with prosthetic and non-prosthetic mechanics, such as repairs, crowns and bridges, and porcelain. No mention is made of direct or indirect inlay techniques and, indeed, the mechanics of conservative dentistry receives less than fair mention. It is true that the publisher's note recommends the book to students in prosthetic dentistry, but the title itself conveys no such limitation.

The inclusion of discussions of the physical and chemical characteristics of the materials themselves gives the book an added value to the student of mechanics and carries the welcome implications that such a student will better appreciate the function of the materials if he knows something of their structure. It would be more consistent if a similar line of attack had been used from the biological standpoint in discussing the setting up of the full dentures, instead of the exhaustive but mechanical concept that is, in fact, presented. Hanau's rules should be given with qualification.

F. F.